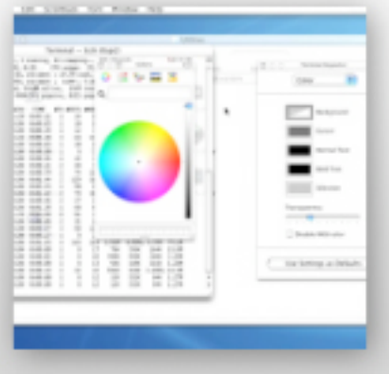
Disc Recording Reloaded

Session 104



Disc Recording Reloaded

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Session Topics

- What is Disc Recording?
- New Panther Features
- API Overview
- Device Profiles

What Is Disc Recording?

Burning Is Hard

- Several man-years of work to implement
- Many different layers of the Mac OS
- Communicating directly to CD/DVD drive
- Stream your data from beginning to end
  - Specialized, cross-platform filesystem
- Thousands of pages of specifications to master
  - MMC, SFF, Mt. Fuji, ISO, ECMA, IEEE, NCITS
  - One book, two book, Red Book, Blue Book
- Resource arbitration
  - You have to play nice with the rest of the Mac OS

Solving the Problem

- Easy
  - Accessible to application developers
  - Hide hardware differences
  - Helpers for common types of data
  - User interface
- Fast
  - No spooling to disk
- Powerful
  - Customize filesystems
  - Able to burn anything

What Is Disc Recording?

- A device abstraction layer
  - Lots of devices, lots of connection interfaces, lots of quirks
- A data-streaming engine
  - Real-time data production
- A content generator
  - Multiple, concurrent filesystems on disc
  - Audio files to CD-DA
- A system framework
  - Apple has done the work and packaged it up for your use

This Means…

- Burning discs is natural
  - Like printing, but for digital media
- You produce content
  - We get it onto the disc
- Your application can be part of the Digital Hub

Disc Recording:
New Panther Features

New In Panther

- Now an umbrella framework
- Toll-free bridging
- Audio file burning
- Pro audio features
  - MCN, ISRC, SCMS, Index points
- Carbon UI
- Device profiles
- /usr/bin/drutil

Disc Recording:
API Overview

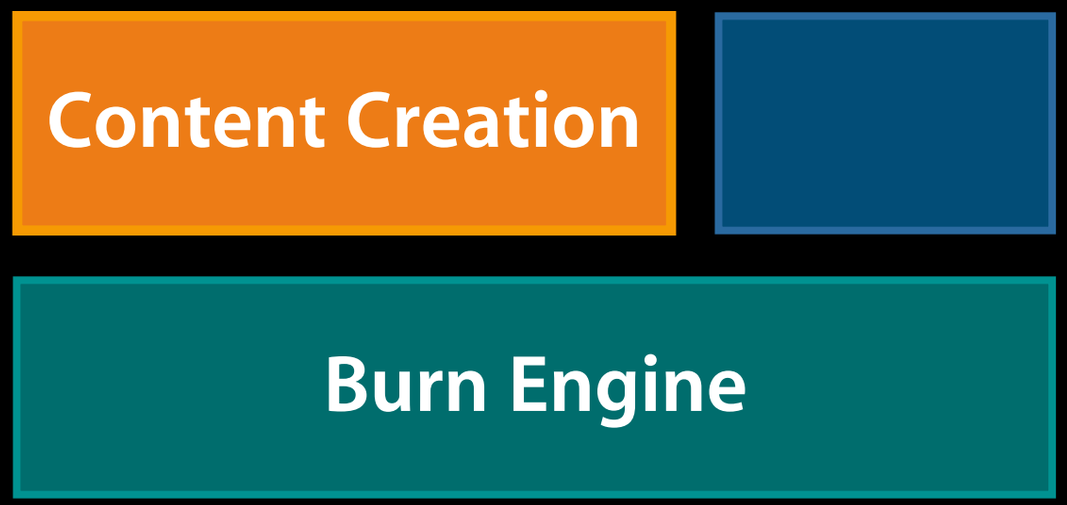
General Concepts

- Object-oriented API
  - C and ObjC
  - Toll-free bridged
- C objects are CFTypes
  - Retain/Release
  - CF collection support
  - Consistent naming conventions
- Objects have property dictionaries
- Thread-safe

Architecture

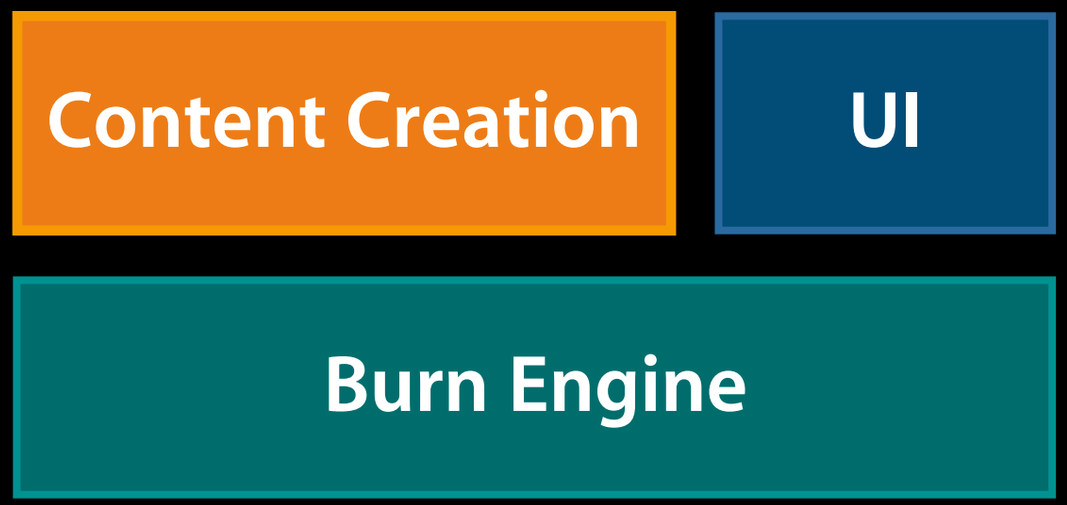
- Burn Engine
  - Device management
  - Burning
  - Erasing

Architecture



- Burn Engine
  - Device management
  - Burning
  - Erasing
- Content Creation
  - Filesystem creation
  - Audio track creation

Architecture



- Burn Engine
  - Device management
  - Burning
  - Erasing
- Content Creation
  - Filesystem creation
  - Audio track creation
- User Interface
  - Setup
  - Progress

A Closer Look

Burn Engine

Content Creation

User Interface

Burn Engine

Burn Engine

- Burning
  - Asynchronous
  - You provide the data
  - Multiple burns at once
- Erasing
  - Asynchronous
  - Multiple erases at once
- Device handling
- Media arbitration

Burn Engine

- Core set of objects
  - DRBurn
  - DRTrack
  - DRDevice
  - DRErase
- Notifications
  - DRNotificationCenter
  - Sign up for notifications on an object

DRBurn

- Represents a burn
- Writes a “layout”
  - Single track
  - Multiple tracks
  - Multiple sessions
- Asynchronous, real-time operation
- Notifications
  - Progress
  - Completion

DRTrack

- Represents a track
  - CD Audio track
  - Data track
  - Other (anything in MMC)
- You provide data through callback
  - Real-time production
  - During the burn
- Maximum data rate

DRDevice

- Represents a device
- Device capabilites
- Media inside the device
- Tray actions: open, close, eject
- Notifications
  - Hot plug/unplug
  - Media inserted/removed
  - Device availability

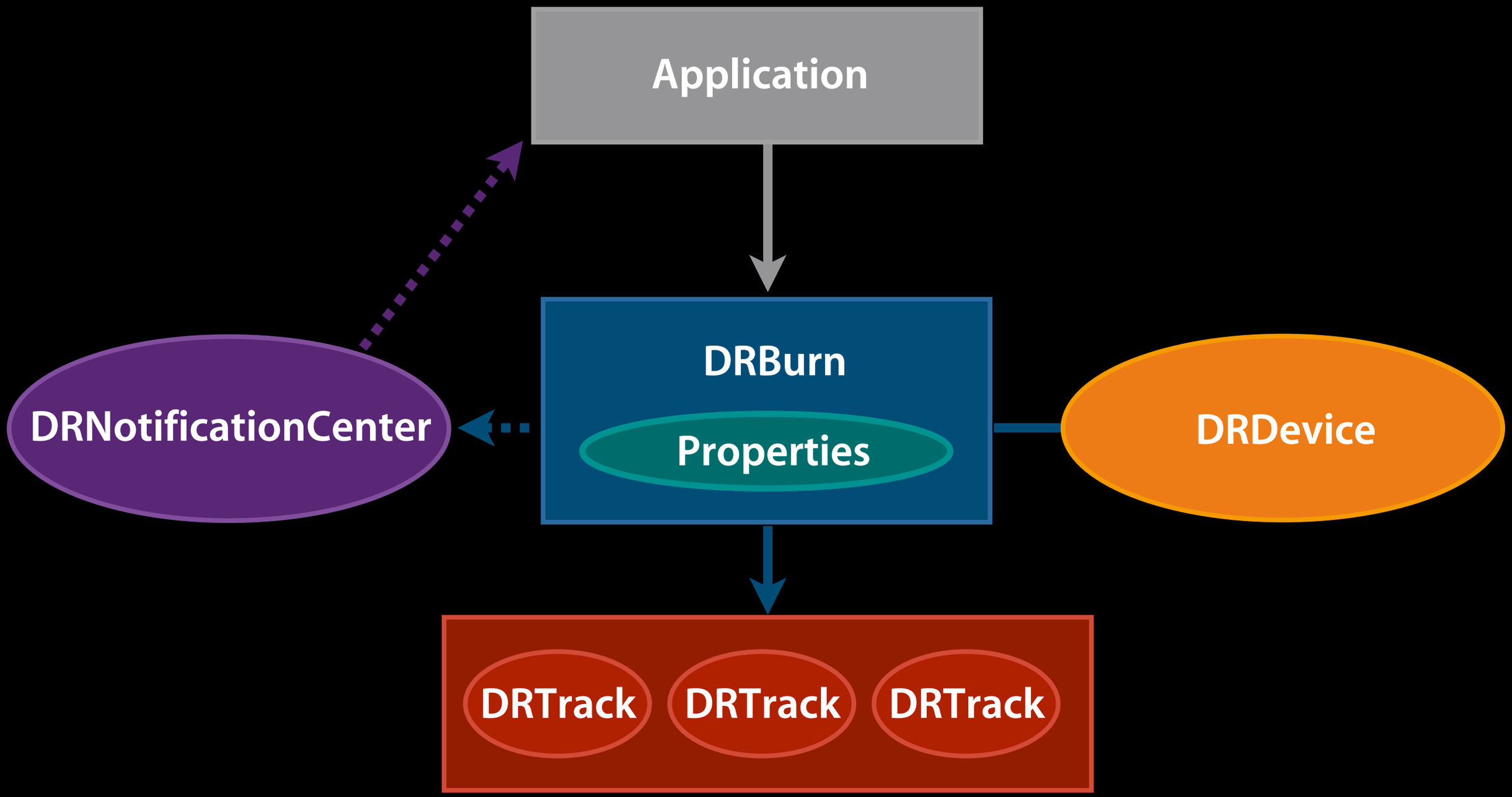
DRNotificationCenter

- Same interface as NS/CFNotificationCenter
- Inter-thread notifications
- Guaranteed delivery
  - Object state always known
- Strongly recommended

Notifications are good

Polling is bad

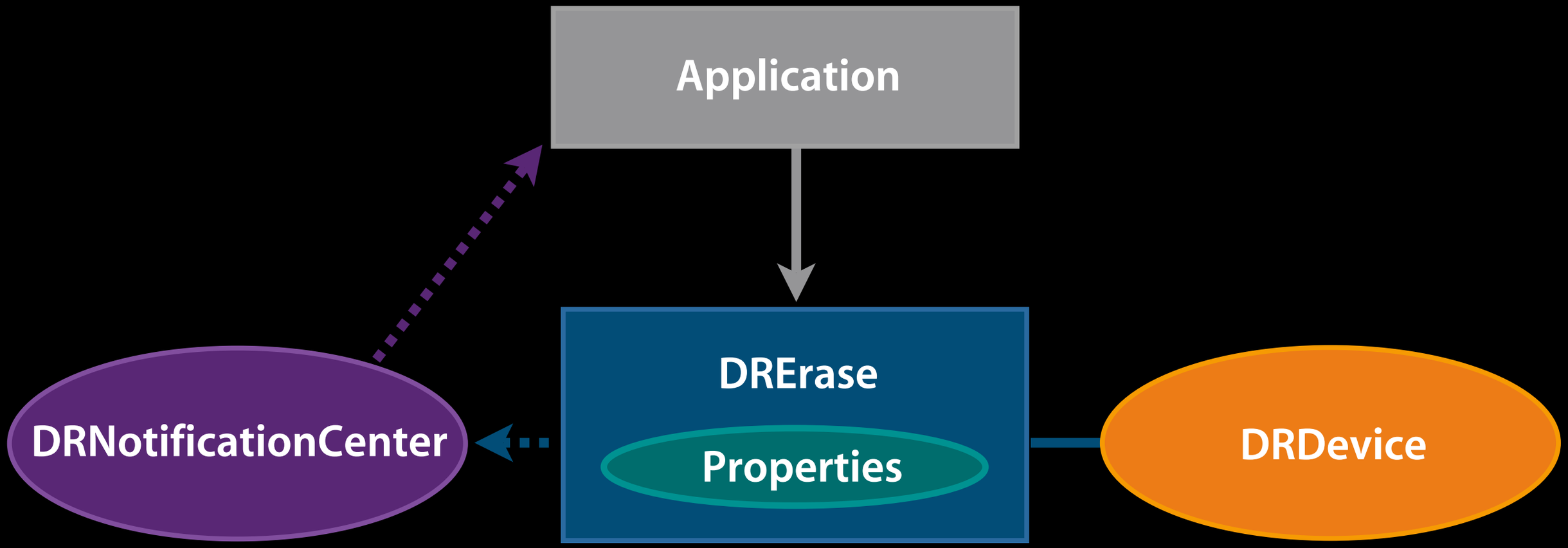
Anatomy of a Burn



DRErase

- Represents an erase
- Start erasing with just one call
- Asynchronous operation
- Notifications
  - Progress
  - Completion

Anatomy of an Erase



Demo

What Happened?

http://developer.apple.com/wwdc2003/urls.html

A Closer Look

Content Creation

Content Creation

User Interface

Burn Engine

Content Creation

- Create filesystems for data discs
  - ISO9660, Joliet, HFS+
  - Hybrid discs
- Create CDDA tracks for audio discs
- Powerful and flexible
- Easy to use

DRFilesystemTrack

- Data track for CD or DVD
- You specify a filesystem hierarchy

Filesystem Objects

- Represents an object in your filesystem
  - DRFSObject
    - DRFile
    - DRFolder
  - Different ways to create them
    - Existing file
    - Data blob
    - Callback routine

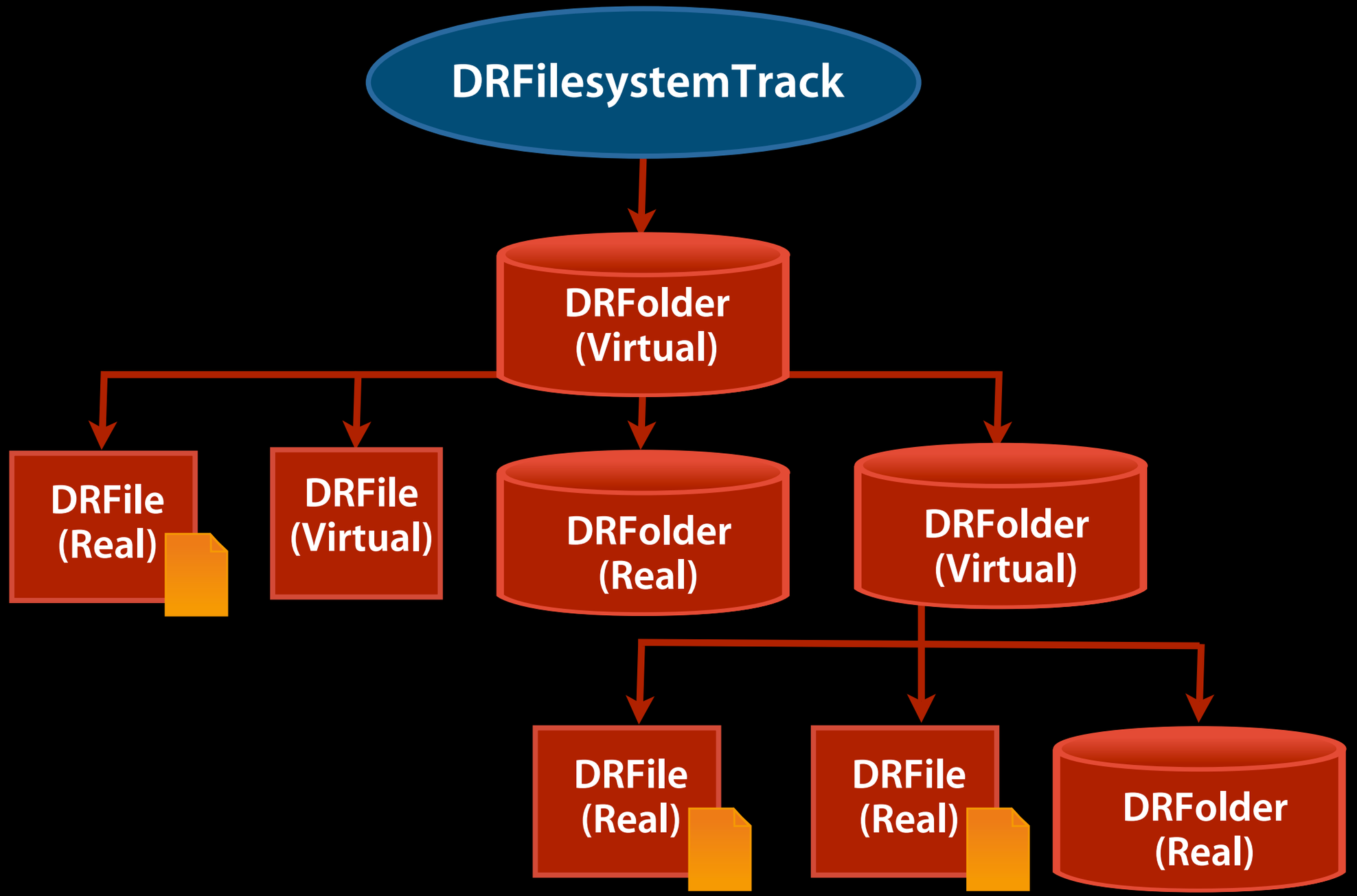
Filesystem Objects

- Real vs. Virtual
  - Real files and folders
    - Copied from an existing filesystem
  - Virtual files and folders
    - Created through the API
    - Data specified at runtime
- Virtual folders define the hierarchy

Filesystem Objects

- Filenames transformed to comply with standards
  - Name for each filesystem is available
  - Change it if desired
- Properties describe metadata
  - Permissions, owner, dates, type/creator, etc.
  - Override properties on both real and virtual objects
- Mask determines presence in filesystems
  - File data shared

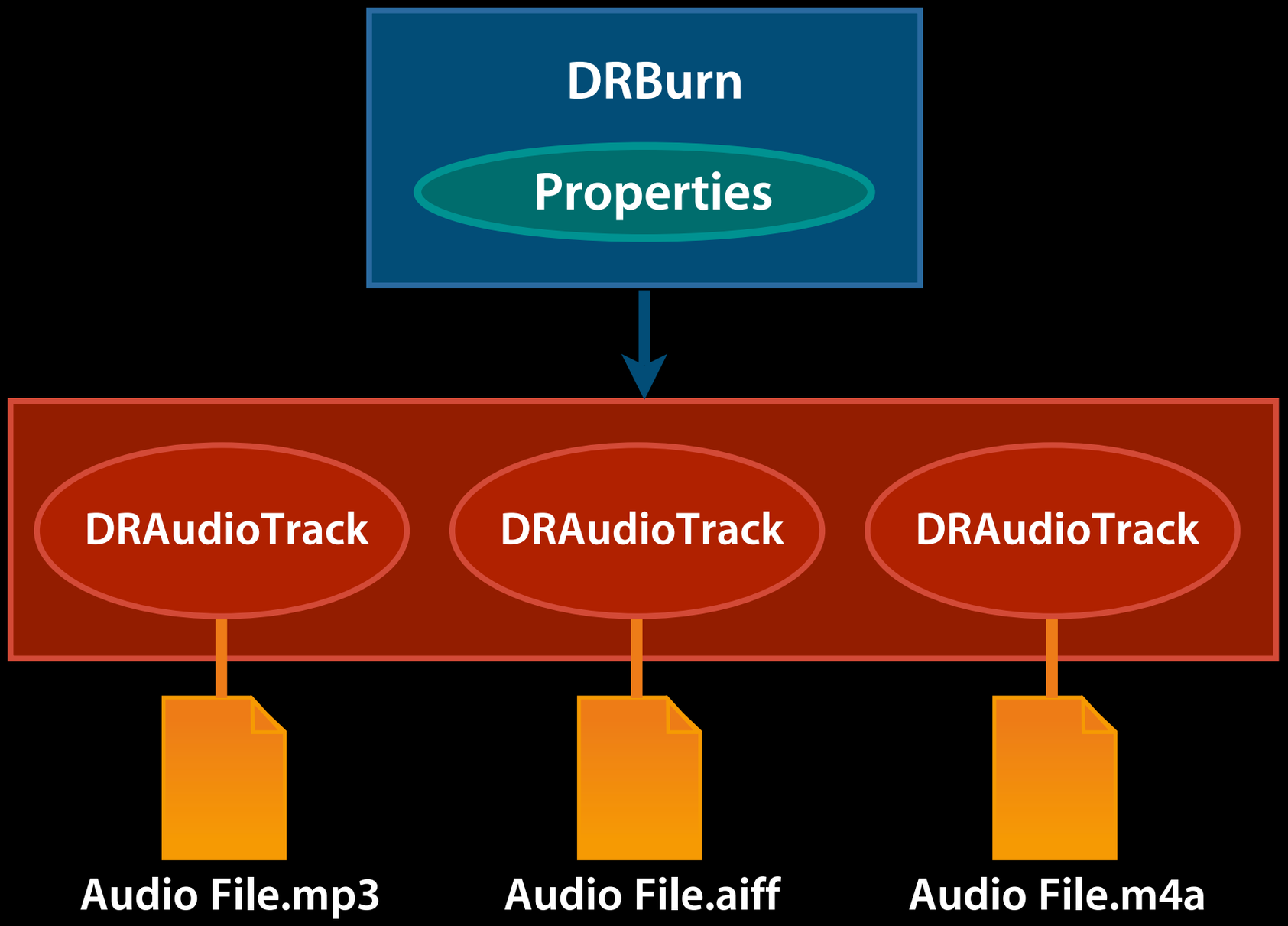
Anatomy of a Data Track



DRAudioTrack

- Red Book audio track suitable for consumer CD players
- Any file QuickTime can read
  - MOV, AIFF, WAV, MP3, M4A, and more
- New in Panther

Anatomy of an Audio Burn



A Closer Look

User Interface

Content Creation

User Interface

Burn Engine

User Interface

- Common user interface for burning and erasing
- Setup panels
  - Device selection
  - Burn and erase options
- Progress panels
- Burn and erase icons
- Cocoa and Carbon
  - Carbon for real this release

Demo

It’s Just That Simple

http://developer.apple.com/wwdc2003/urls.html

Disc Recording: Device Profiles

Device Profiles

- Manufacturers, bundlers add support for their drives
  - Reduces interaction with Apple
- XML plist files
  - /Library/DiscRecording/DeviceProfiles
- Personalities describe matching criteria
- Profile data
  - Describe how device interprets the MMC specification
  - Bugs and quirks in firmware
  - Unimplemented or broken commands

Device Profile Editor

- Creates .drprofile files
  - Prevents mistakes
  - Don’t need to use Property List Editor
- Validates profiles
  - Standard test suite
  - Requirement for “official” status

Demo

Device Profile Editor

http://developer.apple.com/wwdc2003/urls.html

Developer Resources

- Sample code
  - C and Objective C examples
  - Audio, data burning
  - Erasing
  - http://developer.apple.com/samplecode/Sample_Code/DiscRecording.htm
- Mailing list
  - http://lists.apple.com/discrecording

Reference Library

Documentation

Disc Recording Services

http://developer.apple.com/techpubs/macosx/Carbon/multimedia/discrecording/discrecordingserv.html

Wrap Up

Who to Contact

Patrick Collins
Digital Hub Technology Manager
patrick@apple.com

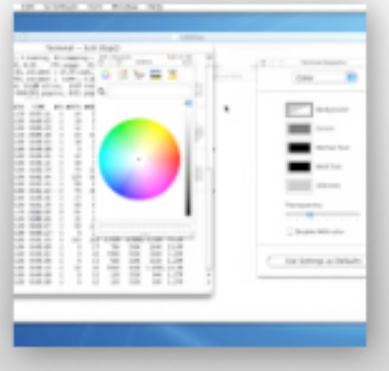
John Bertagnolli
Burning Issues Manager
jbert@apple.com

http://developer.apple.com/wwdc2003/urls.html

Roadmap

405 Audio Formats	Russian Hill Tue., 5:00pm
412 Cocoa User Interface Programming	Presidio Wed., 3:30pm
725 QuickTime and Enhanced CDs	Haight/ Ashbury Thu., 10:30am
111 Writing Threaded Applications on Mac OS X	Pacific Heights Thu., 2:00pm

Q&A



John Bertagnolli, Reese Schreiber, Mike Shields, Drew Thaler, Ed Wynne, Murray Jason
Burning Issues

http://developer.apple.com/wwdc2003/urls.html

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